Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

about seventy-two miles south of the entrance to San Francisco bay. The specimens are rather under, than of, the usual size, and were obtained at the mouth of a lagoon near Santa Cruz.

In a few years we may look for its distribution southerly and along and around Monterey bay, the shores of which are well adapted for this species. As to its introduction at Santa Cruz, I hope to be able to give more particular information hereafter.

——:o:——

THE SQUID OF THE NEWFOUNDLAND BANKS IN ITS RELATION TO THE AMERICAN GRAND BANK COD FISHERIES.

BY H. L. OSBORN.

THE broad continental plateau which fringes our eastern coast, rises in many places near to the ocean's surface, and forms shallows known in sailor language as "banks." These banks have, on the average, a depth of thirty fathoms, though in some places but seven or eight fathoms, and are a favorite resort of the several species of our most important food fishes, visiting the places to prey upon the many forms of marine invertebrates covering these favoring spots in most luxuriant profusion. In most cases the banks are not extensive, not more than from ten to twenty miles in length, but this rule finds a notable exception in the case of the Grand Bank, off Newfoundland. This shoal is in shape nearly an equilateral triangle; its base is two hundred and seventy miles long, running east, north-east, and lying somewhat east of south-east from the island. This northern edge, furthermore, is sixty miles distant from land, and the intervening water has an average depth of eighty-five fathoms. The edge of this shoal is very clearly defined, the water along the northern limit falling suddenly, in the distance of only a mile or two, from thirty to sixty fathoms, while, on the other sides, the descent is frequently very rapid from thirty to one hundred and eighty fathoms. It has been noted as the most favorable grounds for the capture of the cod since before 1740, at which time seventy vessels from Gloucester alone, scoured the banks, and since which time the number has fluctuated, till at present more than four hundred schooners are engaged in the pursuit. The problem of bait has always been a troubling one to this enormous fleet. I am told that in early days salt bait of clams or fish was in universal use, but of late some sort of fresh bait has seemed a necessity, and the squid has become the favorite form. This they are forced to procure at Newfoundland, and they have thus opened a new traffic to the people of the island, and caused, too, at times, much hostility and ill-feeling.

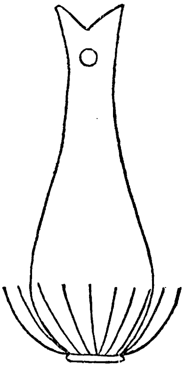
During the summer and fall of 1879, I had the opportunity of spending three months on a codfishing schooner, for the purpose of making zoölogical collections, and also of studying the men and their methods; this gave me a chance to visit a large number of harbors, and to study in some detail the matter of bait.

The bait used during the latter part of the year is the squid; not *Loligo pealii* Les., the common form of the ocean waters south of Cape Cod, but *Ommastrephes illecebrosa* Quatr., a more northern species readily distinguished by its movable eyelids. So many good descriptions and figures of this species are in the reach of every one, that any description of the creature is unnecessary in this place. For accurate description of the wonderful changes of color in the integument, I would refer the reader to Professor Verrill's account[1].

The squid does not appear early in the year, during which time the herring, *Clupea harengus*, and the capelin, *Mallotus villosus*, are used, but "strikes" late in June or early in July, touching first upon the southern points of the island. The natives and the fishermen agree in the opinion that the squid migrates steadily northward during the season, appearing first in the northern harbors two weeks later than in the southern, and finally lingering at northern points in the island after they have entirely disappeared from those further south. One is induced, moreover, to believe in a migration among the squid, from the intermittent manner in which they are captured. At one time they are taken as fast as they can be hauled in, while, again, scarcely any can be caught. Furthermore, captures of different times will often average very differently in size, indicating that those of the same ages move in the same schools, and that one school is replaced by another. Thus on one day we secured a large number of very large squid, the largest measuring 290 mm. and the average 265 mm. from base of tentacles to tip of tail, but on the following day could obtain none whose length was greater than 190 mm.

[1] Invertebrates Vineyard Sound, pp. 442–443, 1874.

Evidence is not wanting to show that the squid do sometimes occur on the Grand Banks. Vessels are reported to have caught their bait while at anchor there, and yet I can but regard this as the exception, and I believe that the habit of the squid is to remain during the summer quite near shore. In examination of the stomach contents of the cod, I saw nothing to indicate the squid's presence on the banks. This to be sure is negative evidence, yet it carries some weight.



Squid jig.

The sole mode of capture of the squid is called "jigging," a term derived from, and descriptive of the process. The only gear is a peculiar hook called a "jig," and a couple of fathoms of "mackerel" line. No bait is employed. The jig is of lead, two inches or thereabouts in length, armed at its base with sharply pointed unbarbed pins radially arranged, and curving upward and outward as represented in the accompanying figure. The jigging is conducted in water of from eight to ten feet, usually from small boats, but occasionally from the vessel's side. The jig is allowed to sink nearly to the bottom, where it is kept constantly vibrating up and down, till the squid is felt upon it. Frequently two jigs are managed, one in each hand.

In its mode of taking the hook, the squid differs from any other animal I have ever met. In place of a nibble followed by a snap with the subsequent struggle for escape, there is a sensation as of some one grasping the hook with his fingers. The squid does not use his mouth in "biting," but merely clasps his tentacles round the jig. The pain from the sharp pins doubtless induces him to escape instantly, but the fisherman who is constantly jerking the jig up and down, pulls in as rapidly as possible, entangling the squid's arms among the pins, and drawing him through the water so fast that escape is impossible.

The instant he emerges from the water he contracts his body, discharging through his siphon a jet of salt water. This is followed by a sucking in of the air by successive respiratory acts, till in its middle portion his cylindrical body has become almost spherical. By a second contraction, the squid now ejects from his siphon a stream of his black, inky secretion. He will usually make one or two or more contractions in an effort to escape, after which he becomes resigned. Not infrequently it happens that the luckless wight has not the squid unhooked before the inky discharge, and may have this sent at himself, since the siphon points away from the animal and upward. I have often seen a fellow struck full in the face by the inky stream, which event was invariably followed by a stream of almost as black abuse intended for the benefit of the squid.

The squid is unhooked by simply turning the jig upper end downward, when he readily drops off. For the most part they are caught wholly by the natives, the Americans usually preferring to look on or to find amusement ashore, though in some cases the fishermen themselves jig also. This, however, is apt to excite jealousy among the natives, or even such hostile feelings at times as to induce them to forcibly prevent the Gloucester men from catching their own bait, or even to purchase it in their harbor. The scene when the squid are thick is really exciting, the streams rising here and there, in twenty directions at once, point out the rapidity of the catch, and the monotonous noise of the squirt is only varied by an occasional murmur of discontent from this or that unfortunate as he lifts his querulous voice. In the dull time most of the jiggers drop away, leaving only those most long-suffering ones, but they return pell-mell if the frequent squirt shall indicate renewed activity.

The purchase of the squid is made at a certain price per hundred, this being usually thirty-five or forty cents, though occasionally falling as low as twenty-five cents. The price but rarely rises above forty cents, for the profits are too small to permit of its reaching a much higher figure. The number used by a single vessel in only two months is astounding. Our vessel, a small one, made three "baitings," fishing each time about two weeks, and used in that time 80,000 of the squid. A larger vessel, carrying two more men, would in the same time have probably used over 100,000. As to the whole number of squid used in a single season by Americans alone, I have not sufficient statistics to give an accurate statement, it would, however, be reckoned high in the tens of millions.

In delivering his squid, the native accurately counts them, taking up five at a time and throwing out one at every hundredth for tally. And in this the native stupidity appears, for had he ten thousand to dispose of, he would handle over the entire number rather than estimate their value by weighing or measuring. Since they must be each paid separately, and never have themselves any change, the skipper is forced to carry with him a large supply of fractional pieces, so that he will not unfrequently have one or two hundred dollars on board in five, ten and twenty cent pieces of Newfoundland currency, having secured them at some of the larger towns by a draft on his vessel.

It is very strange that, though such an enormous and often pressing demand for the squid exists, no enterprise has ever been undertaken for facilitating its supply with the least possible delay. A vessel is by no means infrequently delayed two or three weeks, and in the course of her search forced to visit harbor after harbor till she had coasted along-shore three or four hundred miles. To such an extent is this true, that the vessel will often spend more time in the search for bait than it afterward takes to use it up. This trouble might be obviated with the greatest ease, for, in time of plenty, the squid might be preserved in ice to be drawn upon when, in a lull, the catch was not large enough to supply the incoming vessel, and the vessel could then return to her fishing ground with the loss of but a single day. Nor would there be any difficulty in procuring ice in Newfoundland during the winter, nor any danger that the bait could not find a market, for the fishermen would not be long in advertising such a place both far and wide. Even if there were some means of communication between the harbors the trouble would be far less than at present; it would be utterly impossible to drive a horse in most directions, and there is scarcely a telegraph line in the island. Hence when the fisherman seeks bait he must cruise about till he finds it, and at present he spends twice as much time in sailing and bait-hunting as in the actual work of fishing.

When at night the day's catch is brought on board, the men proceed to preserve the squid either by salting them or by placing them in ice. In case the season is growing late the skipper has several thousand well salted and stowed for use when fresh squid can no longer be had. But most of the squid are sandwiched in layers of two or three deep between layers of finely broken ice in bait bins in the vessel's hold. Twenty-five or thirty thousand are thus cared for at a "baiting" and will keep in fit condition for use from two to three weeks. In using them each squid is cut into about five pieces and one piece is used for each hook. The hooks are usually well cleaned by the carnivorous gastropoda which infest the banks and by the various fish which are not caught, so that the same piece of squid is rarely used on two occasions. The fish do not bite with the same avidity at the last of the baiting, the fresh bait securing by far the most fish. The salt squid is nearly useless in the summer and early fall, but late in October, I am told, that they are used with considerable success.

In what I have said, I have made no mention of any use of the squid save by the Americans, but I cannot leave the subject without a brief mention of other uses fully as important as this. The Newfoundlanders themselves use an enormous number, both for bait in their shore fisheries, and as a fertilizer for their land. I have been assured, also, that they are good to eat, but though food materials are not abundant on the island, they are not put to this use there so far as I know. The French, moreover, have very extensive fisheries on the Newfoundland coast fully as important as the American, I should judge, their vast size being insured by a bounty offered by the government to fishermen, and by the practice of reinforcing the numbers from among the national convicts. These French vessels do not seek their own bait as is the case among Americans, but are supplied by vessels, which make a specialty of collecting bait, and spend their time alternately in its search, and in its delivery. To a very large extent, I understand, the French use salt bait, they being content with small catches, while the American is disgusted unless he makes fine hauls every day.

And having thus seen the present importance of this industry, does it not seem strange that it has existed but ten or fifteen years, and that, previously for one hundred and fifty years, innumerable fish were captured with salt bait, or the viscera from the catch of the day before? This fact illustrates a most striking characteristic of the American fisherman—the strong conviction that the fish have decided preferences in the matter of bait and will not take any kind which is out of season. He will often spend the entire month of August in fruitless search rather than use herring or capelin and gain but a moderate success; nor could any argument convince him that a codfish would bite at a salt clam while "the fleet was using squid."

THE BRAIN OF THE EMBRYO AND YOUNG LOCUST.[1]

BY A. S. PACKARD, JR.

[*Continued from April number.*]

Structure of the Brain in the Embryo Locust.—Much light may be thrown upon the structure of different parts of the adult brain if we can trace their origin in the embryo, or in the larval and pupal conditions. Hence, we have, with what material we could obtain, made a series of sections of the embryo and different stages of the larva and pupa, with some results of considerable interest and importance. No one, we belive, has yet examined the topography of the brain of the embryo insect. The only observer who has studied the brain of the larva, as compared with the adult, has been Flögel. Speaking of the cockroach, he says:

> "Of special interest would be an investigation of the development of the separate parts of the brain. The difficulty of making preparations of small heads has been such that no particular results have been reached. Still, I can say this much, that in small creatures, 7–8 mm. in length, all the parts are present, only of a finer and more delicate structure than in the large adult 25 mm. in length."

He says that in the Hymenoptera he has discovered much concerning the development of the parts of the brain; that in bee larvæ the calices are present, though very small and with thin walls. The peduncle and trabecula have reached their ultimate proportions more nearly than the cauliculus, which is still very thin. In the larval ants the central body and entire mushroom

---

[1] Adapted from the 2d Report of the U. S. Entomological Commission, Washington, 1880.